

WORKING PAPER

A COMPARISON OF LONG-RANGE BOMBERS AND NAVAL FORCES (U)

David A. Perin

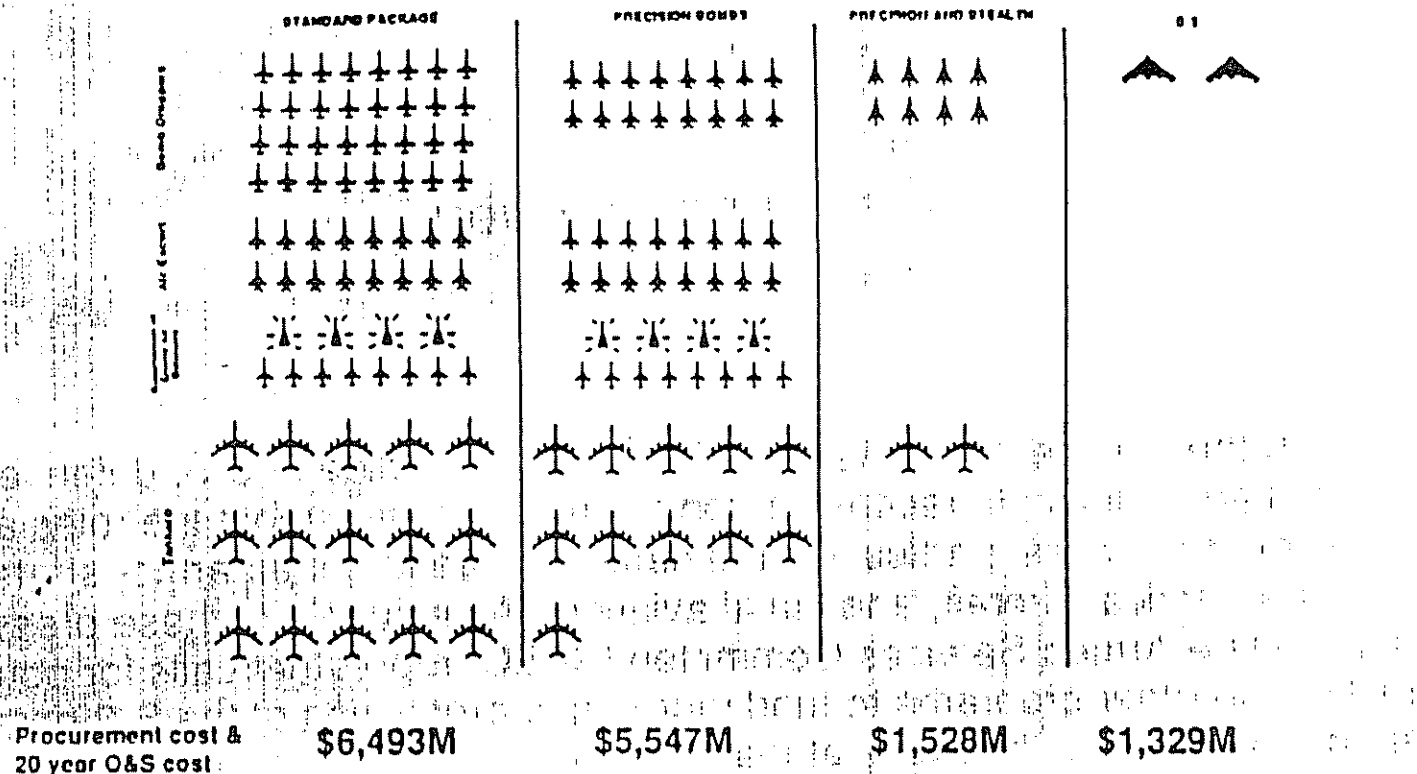
Force Planning and Evaluation Program
FORCE STRUCTURE DIVISION

Nov 91

This document contains preliminary analysis that is subject to further review and modification. It may not be quoted or cited and should not be disseminated further without the express permission of the cognizant CNA Vice President. This paper does not necessarily represent the opinion of the Department of the Navy.



WHAT THE B-2 OFFERS



And the B-2 can do jobs no other aircraft can do....

From Air Force stealth-week handout,
reprinted in the SASC report.

COST SAVINGS FROM TRADEOFFS AT THE MARGIN

"The committee [SASC] believes there are a number of categories under which tradeoffs at the margin should be conducted. ... Some exemplary questions are:"

- "If the B-2 can arrive at crisis scenes within hours, do we need as many forward-deployed carrier task forces?"**
- "If the full force of B-2s with worldwide range and rapid arrival is acquired, how many carrier air wings and carrier battle groups will be needed?"**
- "If B-2s can assume part of the early attack mission, how many attack aircraft does the Navy need to replace? Would a different mix of non-stealthy A-6 and F-18 aircraft be acceptable?"**

PART III

COST-EFFECTIVENESS COMPARISONS

- **EQUAL-COST FORCES**
- **STRIKE EFFECTIVENESS**
 - Payload
 - Sortie rate
 - Survivability
 - Responsiveness
 - Lethality

COST

- **COSTS ARE RELEVANT TO FORCE COMPARISONS**
- **SUNK COSTS ARE FOREVER SUNK**
- **ESTIMATING COSTS IS HARDER THAN IT LOOKS**
 - COSTS OF NEW PROGRAMS ARE UNCERTAIN
 - WHICH COSTS SHOULD BE INCLUDED?
 - SAVINGS DEPEND ON THE PRECISE PROGRAM ALTERNATIVES
- **EQUAL-COST FORCES ARE DESIRABLE WHEN MAKING GENERAL COMPARISONS**

Cost is an important factor, particularly in an era of declining budgets, but estimating potential cost savings is not as straightforward as might seem at first glance. To begin with, history has shown that problems and program stretchouts often lead to higher costs than originally estimated. When comparing different types of systems, however, the uncertainty in specific costs is usually less important than the issue of which costs are

COST COMPARISONS

Average cost per aircraft (\$FY91) ^a

	<u>R&D</u>	<u>Procurement</u>	<u>Total</u>
B-2	(sunk)	\$500M ^b	\$500M
A-X	\$25M	\$100M ^c	\$125M
F-18E/F	\$ 5M	\$ 75M ^d	\$ 80M

a. Flyaway, initial spares, and unique ground support.

b. For proposed buy of 60 additional aircraft.

c. For a buy of 400 to 500 aircraft.

d. For a buy of 1,000 to 1,400 aircraft

EQUAL COST 60 B-2s = 240 A-Xs or 375 F-18E/Fs

This chart shows three aircraft forces that are equal in acquisition costs. The costs

EFFECTIVENESS FACTORS

<u>Factor</u>	<u>Comment / Key issue</u>
Payload	Important for single strike
Sortie rate	Important for a campaign
Survivability	Robustness of stealth?
Target acquisition and responsiveness	Important for mobile/ emerging targets
Weapons effectiveness	Low-cost PGM for the B-2?

Bottom Line: *TARGETS KILLED*

WARFARE CAPABILITIES

<u>Warfare Task</u>	<u>CVBG</u>	<u>Bombers</u>
• STRIKE WARFARE	YES	YES
• AIR SUPERIORITY ANTI-AIR WARFARE	YES	NO
• ANTISURFACE WARFARE	YES	NO*
• ANTISUBMARINE WARFARE	YES	NO
• MINE WARFARE	YES	SOME

*B-52s can deliver HARPOON vs ship formations in the open ocean, but are not appropriate for inshore ASUW that is typical of regional conflicts.

This chart points out that a carrier battle group possesses multiple warfare

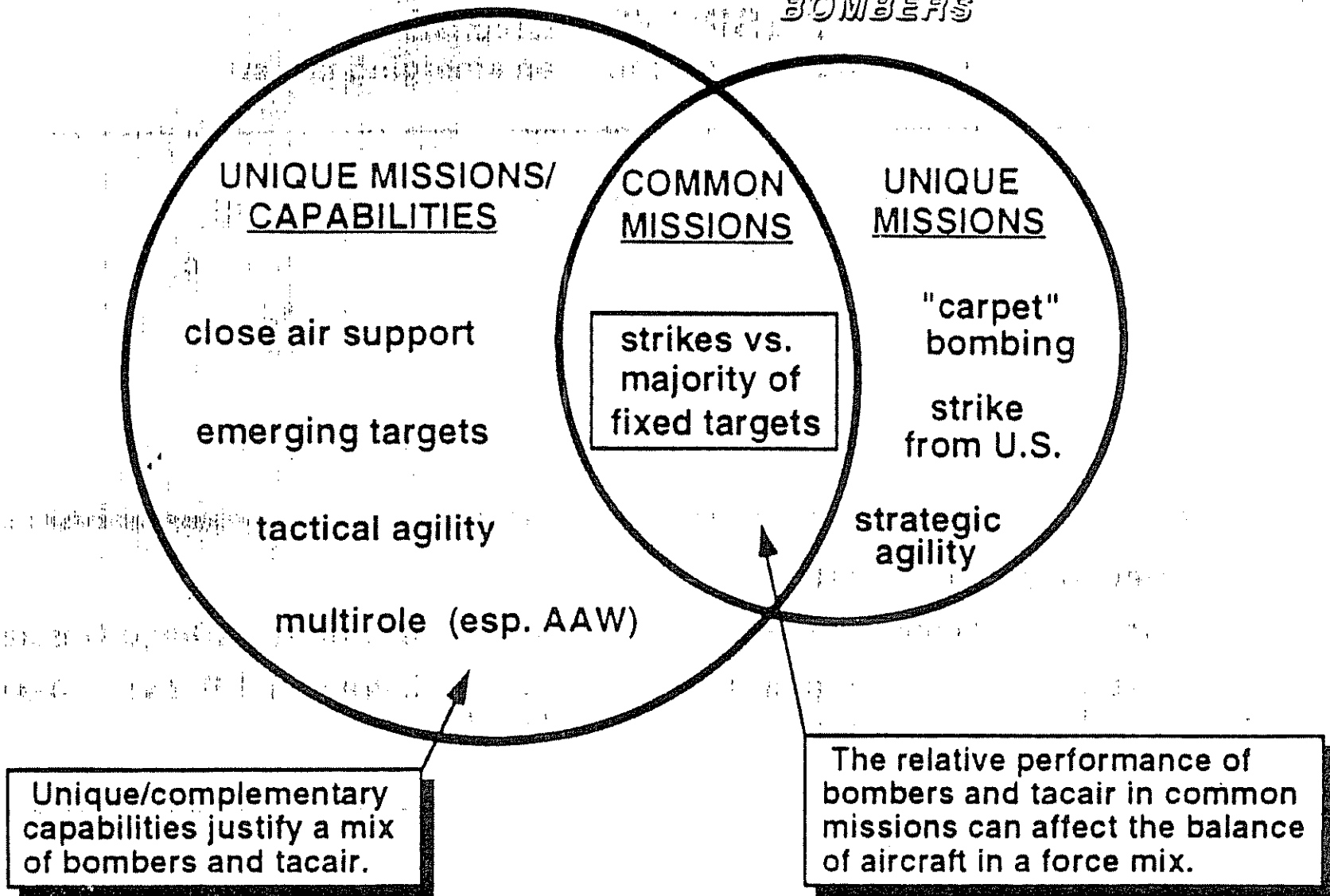
TASKS IN PEACETIME AND CRISES

<u>MISSION</u>	<u>CVBGs</u>	<u>Bombers</u>
• PROMOTE REGIONAL STABILITY (e.g., routine deployments)	YES	NO
• PROTECT PEOPLE AND PROPERTY (e.g., Iran hostage rescue)	YES	NO
• MAKE A SHOW OF FORCE (e.g., Gulf of Libya ops)	YES	YES
• PROTECT, QUARANTINE, OR INTERDICT SEA/AIR TRAFFIC (e.g., Earnest Will convoy ops and capture of <i>Achille Lauro</i> hijackers)	YES	NO
• FORESTALL OR RESPOND TO HOSTILE OR TERRORIST ACTS (e.g., strikes at Libya)	YES	YES
• INTERVENE IN CONFLICTS (e.g., Grenada)	YES	SOME

A major reason for the frequent use of carrier battle groups and tactical forces is their suitability for a variety of crisis situations. This chart categorizes the types of

TACTICAL AIRCRAFT

BOMBERS



SURVIVABILITY OBSERVATIONS

- STEALTH IS GREAT, BUT

- STEALTH \neq INVISIBLE (visual, some IR/radar)
- IF THE B-2 IS DETECTED, IT'S IN DANGER
- EVEN SMALL ATTRITION RATE IS UNSATISFACTORY, OFTEN

- DAYLIGHT OPS ARE RISKY; EVEN AT NIGHT, SUSTAINED UNSUPPORTED OPS ENTAIL RISK

- B-2 WOULD BENEFIT FROM STRIKE SUPPORT PROVIDED BY TACTICAL AIRCRAFT

In sum, stealth is a revolution in air operations that has been demonstrated in combat. However, stealthy does not mean invisible. Stealth aircraft are susceptible.

SURVIVABILITY FACTORS

<u>FACTOR</u>	<u>B-2</u>	<u>A-X</u>
OBSERVABLES	VERY LOW ALL ASPECT	VERY LOW ASPECT?
MANEUVERABILITY	2-3 g	6-7 g
SPEED	480 kt	540-960 kt
ARMs / AAMs	?? / NO	YES / YES
STRIKE SUPPORT	?	YES

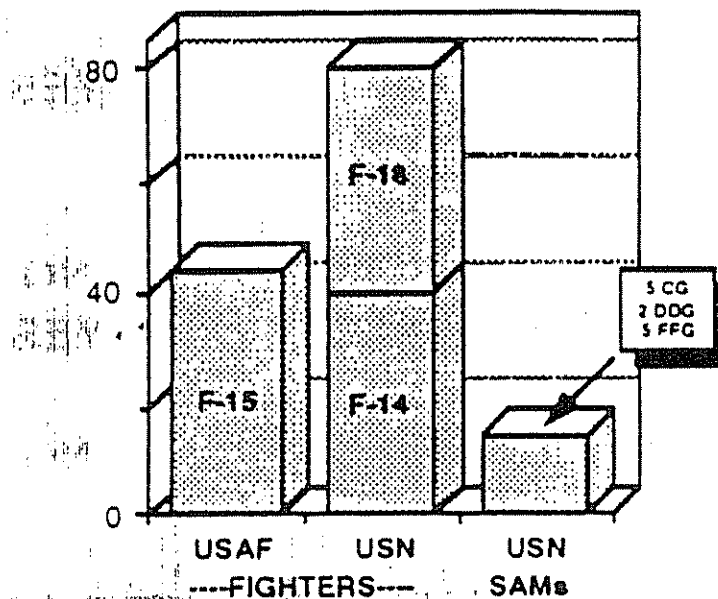
This chart compares the basic survivability features of the B-2 and the A-X. The main point is that B-2 survivability depends on a great many factors.

BOMBING: IS IT DECISIVE?

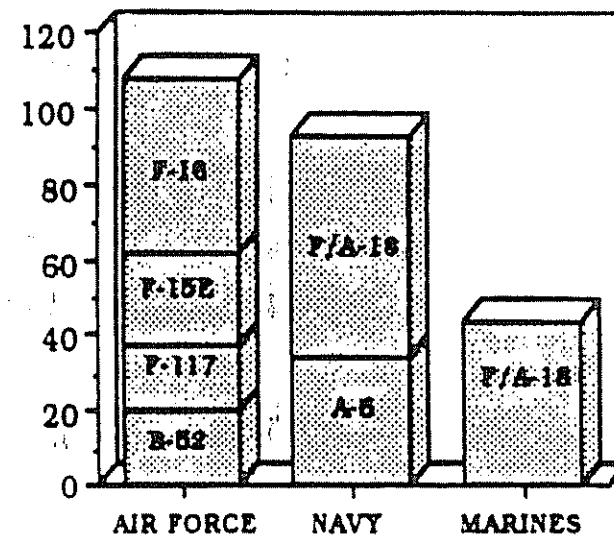
- STRATEGIC BOMBING THEORIES ORIGINATED IN THE 1920s
- BOMBING WAS NOT DECISIVE IN WORLD WAR II UNTIL THE USE OF NUCLEAR WEAPONS
- THE BOMBING CAMPAIGNS IN KOREA AND VIETNAM WERE NOT AS EFFECTIVE AS EXPECTED AND NOT DECISIVE
 - Nuclear weapons proved unusable, and conventional weapons were not sufficiently effective
- DESERT STORM HAS LENT NEW CREDIBILITY TO BOMBING
- BUT, THE NATION STILL REQUIRES A BALANCED COMBINED ARMS CAPABILITY TO DEAL WITH A RANGE OF THREATS
 - In war, the outcome is still decided on the ground
 - The ideal conditions of Desert Storm may not be repeated

Up to this point, the argument has presumed that the U.S. requires a robust combined arms capability. There is a contrary, albeit a minority opinion that strategic

DESERT SHIELD DATA



Air defenses on-scene at C+3



Strike aircraft on-scene at C+15

PAYLOAD DELIVERED PER DAY

AVAILABLE AIRCRAFT NUMBERS

X

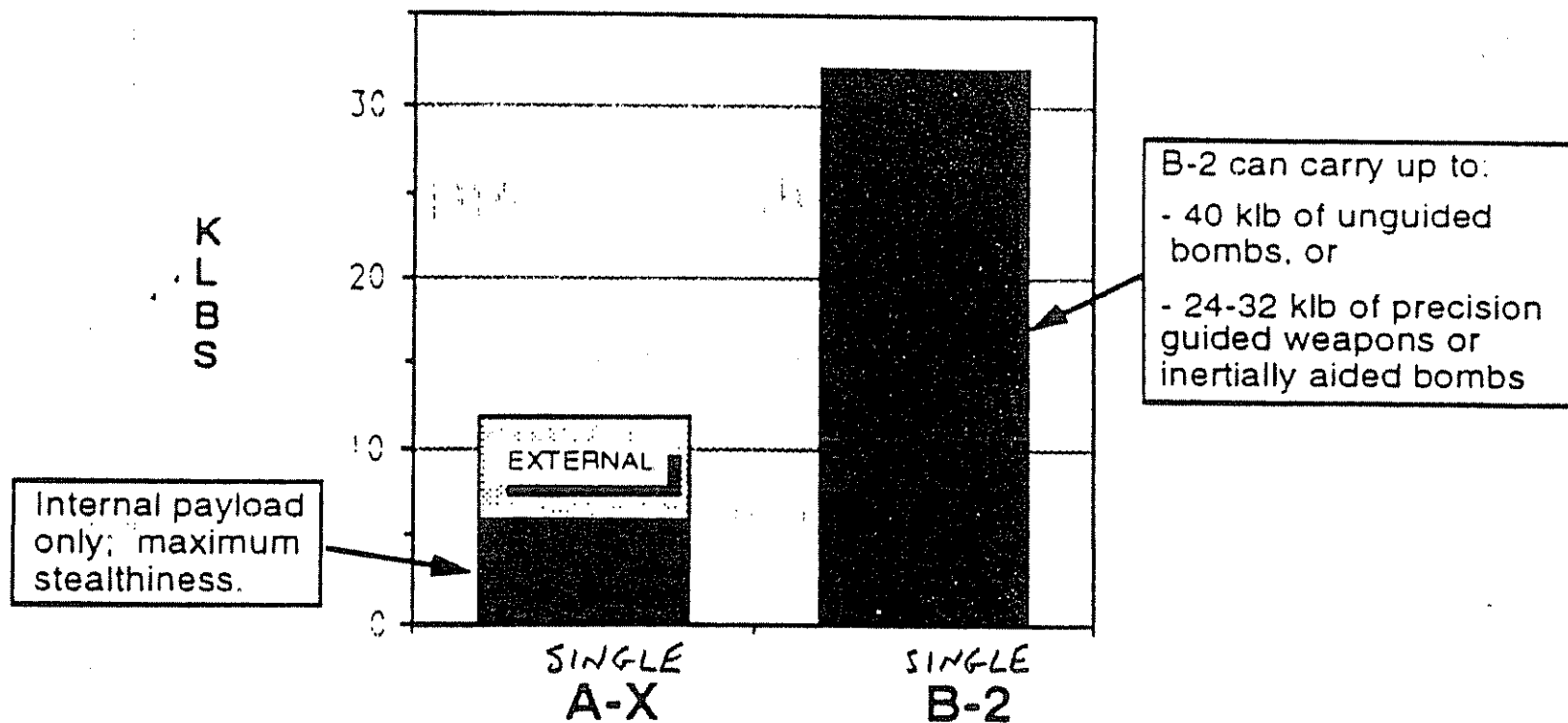
PAYLOAD/AIRCRAFT

X

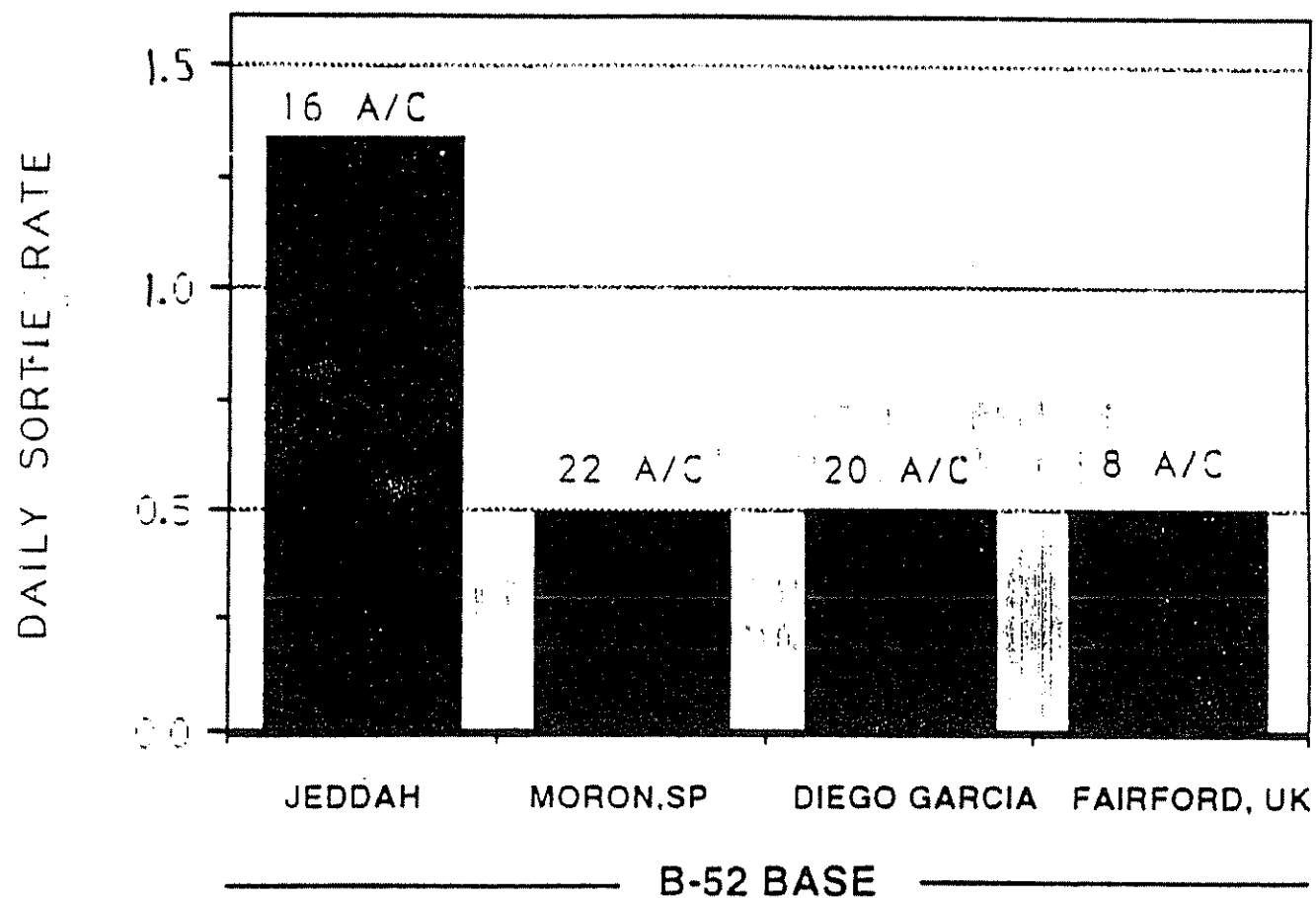
SORTIE RATE

(SORTIES FLOWN PER AIRCRAFT
PER DAY)

PAYLOAD



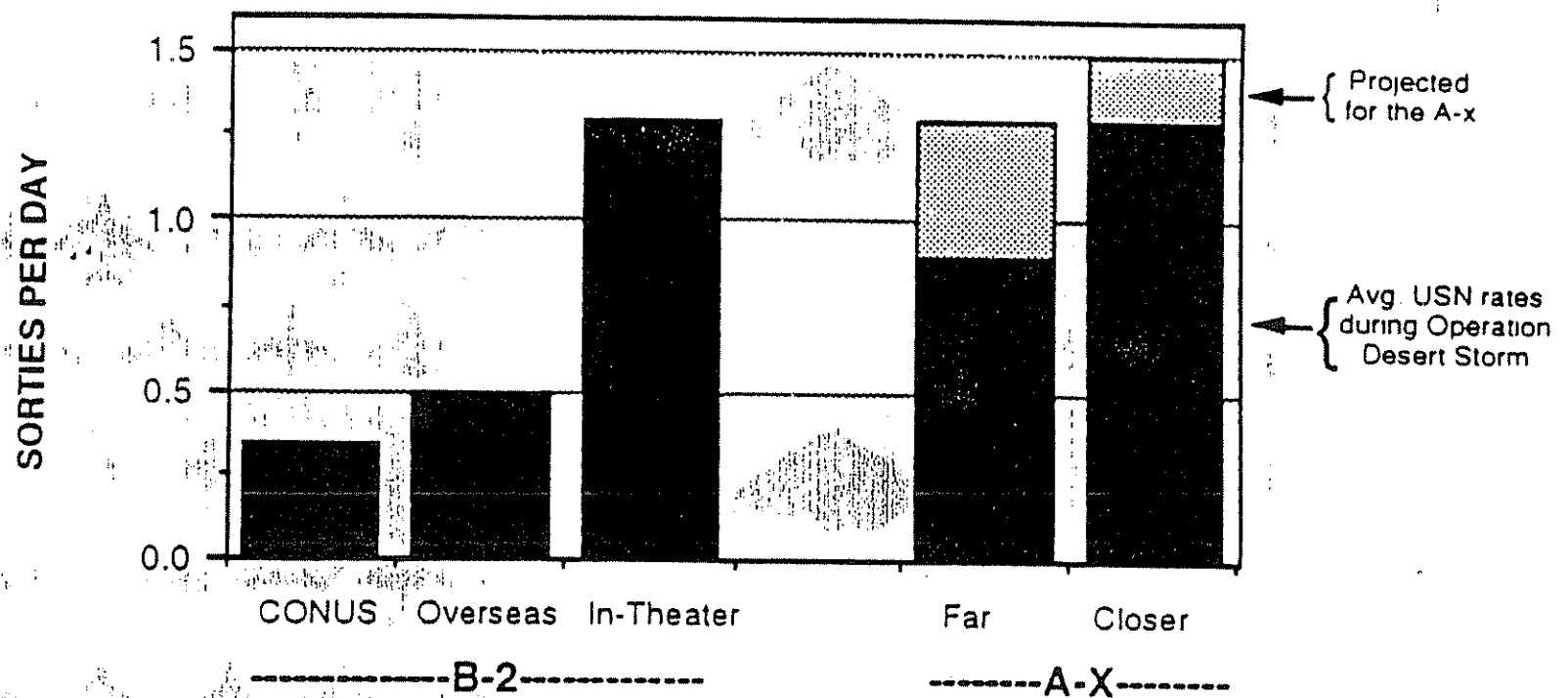
CUMULATIVE AVERAGE B-52 SORTIE RATE DURING OPERATION DESERT STORM (Based on Air Tasking Order)



A-X SORTIE RATES

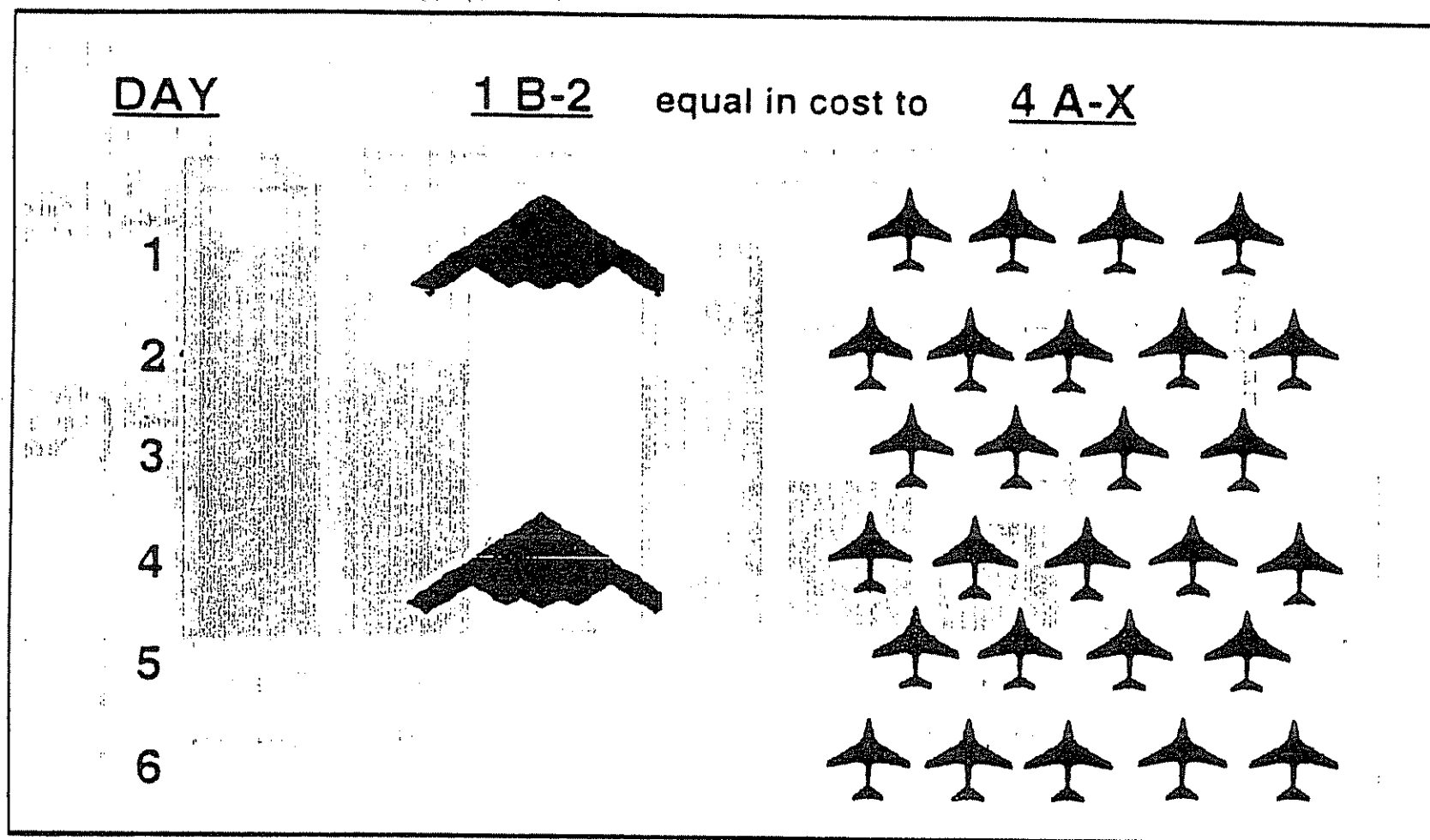
<u>SOURCE OF ESTIMATE</u>	CV POSITION	
	<u>FAR</u>	<u>CLOSER</u>
AVERAGE DESERT STORM DATA FOR NAVAL COMBAT AIRCRAFT	0.9	1.3
PROJECTED FUTURE CAPABILITY FOR THE A-X SQUADRONS	1.3	>1.5

SORTIE RATE ASSUMPTIONS (for 30-day campaign)

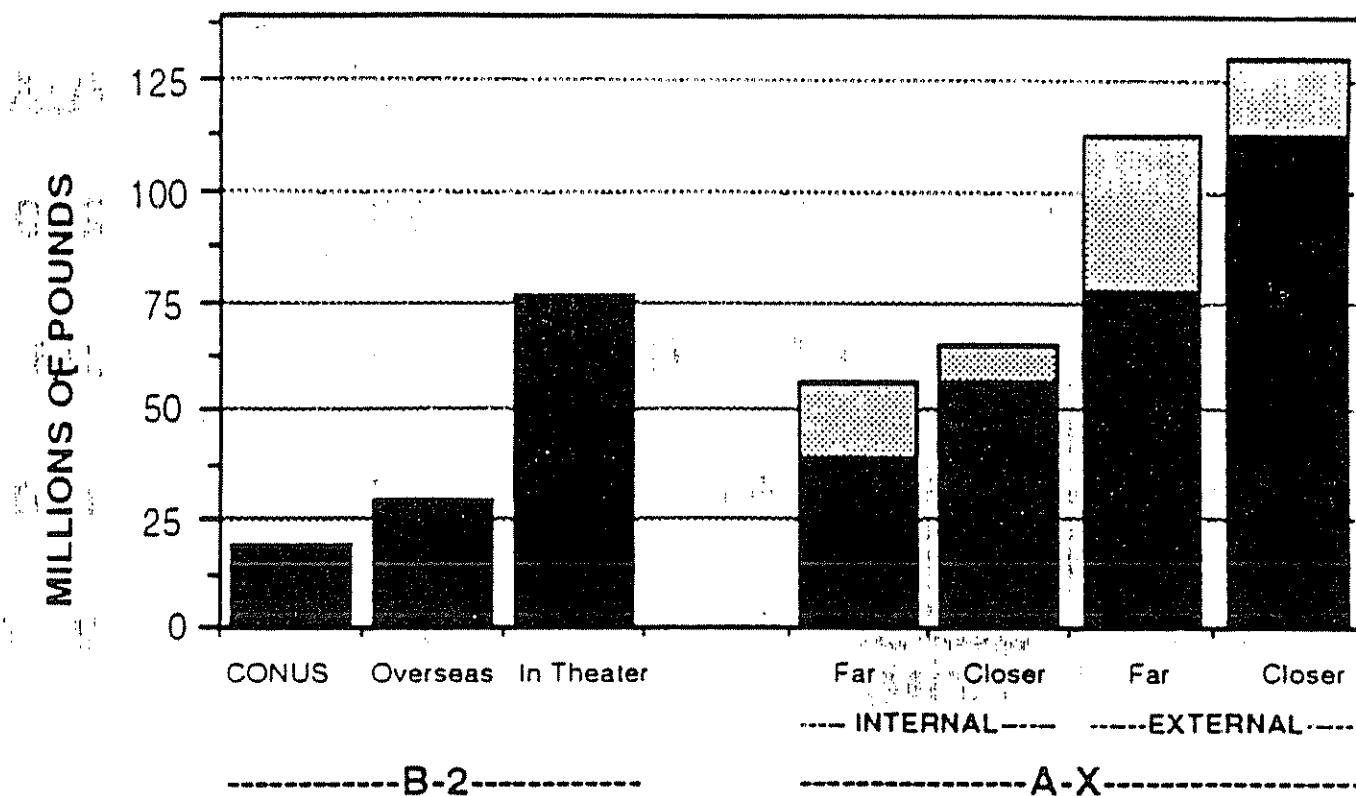


SORTIES TO THE GULF

DURING THE FIRST SIX DAYS



PAYLOAD DELIVERY POTENTIAL IN 30 DAYS (Equal-Cost B-2 and A-X Inventories)



The above chart shows the amount of payload delivered in a 30-day strike

FORCES AVAILABLE FOR OPERATIONS

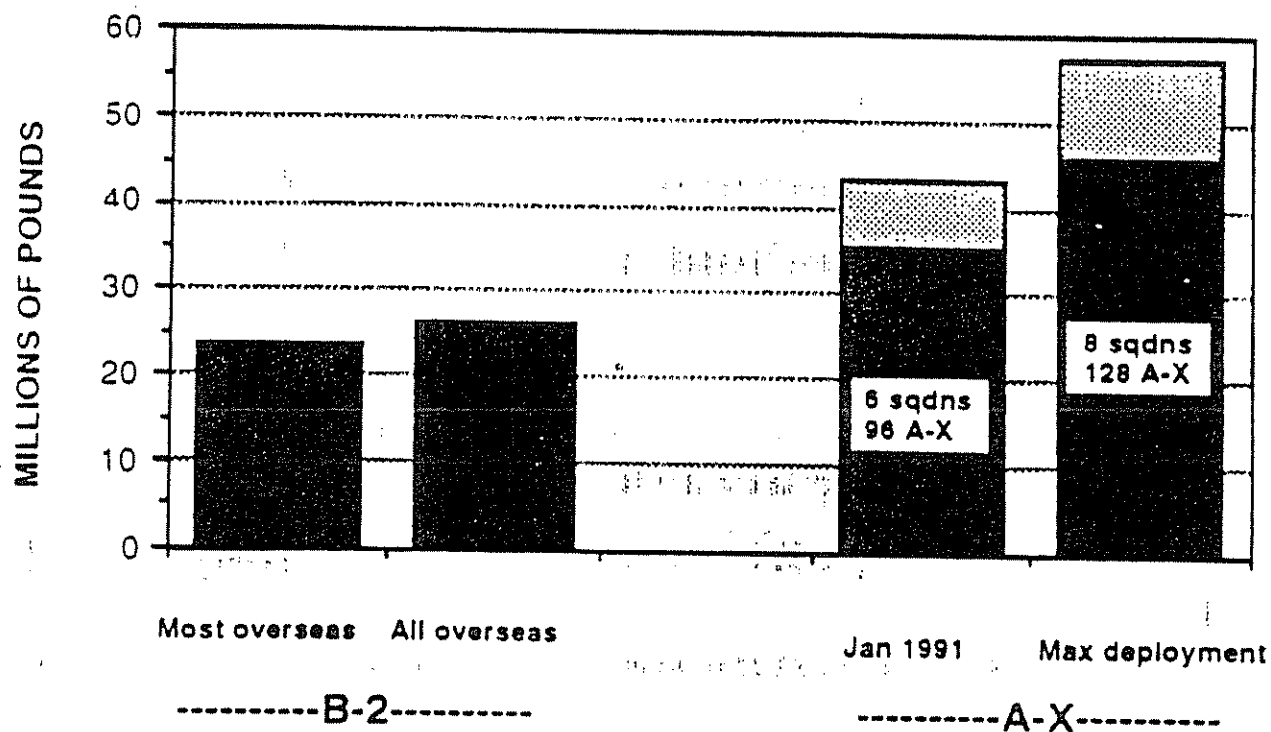
	<u>B-2</u>	<u>A-X</u>
EQUAL-COST INVENTORY	60	240
FRACTION NOT AVAILABLE	.20	.25
AVAILABLE AIRCRAFT	48	180
FRACTION USABLE BY THE THEATER COMMANDER	1.0	0.2 - 0.8 *

* Depends on scenario, esp. warning time

LONG-WARNING SCENARIO

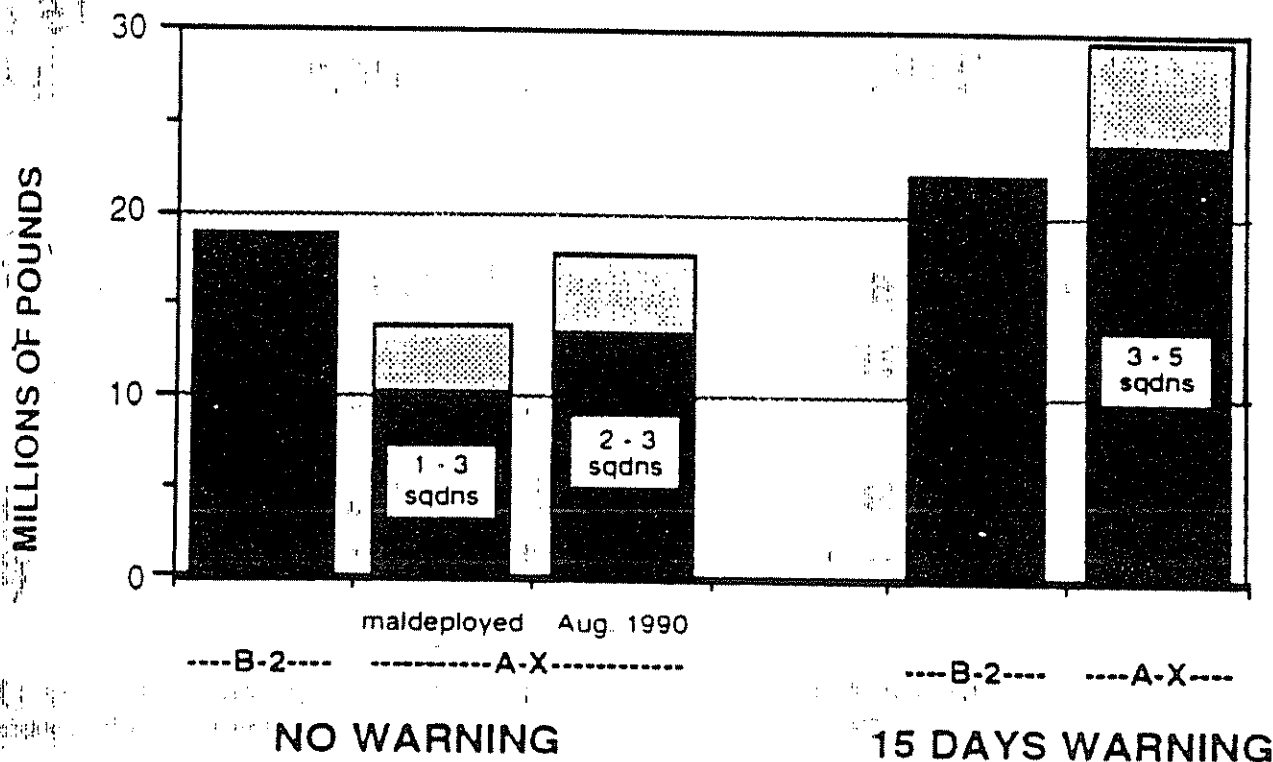
(SIMILAR TO DESERT STORM)

Payload Delivered in the First 30 Days



SHORT-WARNING SCENARIO (SIMILAR TO DESERT SHIELD)

Payload Delivered in the First 30 Days



RESPONSIVENESS

(Time to deliver weapon to an emerging target)

	<u>FROM BASE</u>	<u>AIRBORNE</u>
A-X	1 - 2 hr	< 9 min.
	a	
B-2	2 - 8 hr	< 22 min.
	b	

a. Depends on CV location.

b. Basing in theater - at intermediate overseas basing (e.g., Diego Garcia)

c. Respond to emerging target in 200 x 200 n.mi. area for 1 B-2 vs. 4 A-Xs, which represents equal-cost level of effort.

This chart provides a simple illustration of the differences in responsiveness between tactical aircraft and long-range bombers. The first case is for aircraft in a rapid response

STRIKE EFFECTIVENESS SCORECARD

WEAPONS
EFFECTIVENESS

USAF/USN plan to provide a broad range of weapons for the B-2/A-X. The B-2 needs a low-cost PGM.

TARGET ACQUISITION
RAPID RESPONSE

Tacair is more responsive due to larger numbers and close-in basing.

SURVIVABILITY

- B-2 has all-aspect stealth--but still some risk in sustained ops vs. full-up defense. Support from tactical forces desirable.
- A-X more robust: stealth+speed+AAMs.

RANGE/PAYLOAD

Strength of heavy bombers:

- Long range = strategic agility
- Big payload = single strike potential

SORTIE RATE

Strength of tactical aircraft:

- Many sorties = tactical agility and cumulative strike potential

STRIKE EFFECTIVENESS: SUMMARY OBSERVATIONS

- In most cases, the A-X can deliver as much or more weapons payload per dollar than the B-2 over the course of a strike campaign.
- The B-2 and A-X offer complementary capabilities at both the tactical and the operational levels.

B-2

- LONG RANGE
- LARGE PAYLOAD
- MASS/SHOCK
- STRATEGIC AGILITY

A-X

- HIGH SORTIE RATES
- RAPID RESPONSE
- MULTIROLE CAPABILITY
- TACTICAL AGILITY

PART II

TRADEOFFS AT THE MARGIN

- **REDUCE FORWARD DEPLOYMENTS ?**
- **REDUCE NUMBER OF CVBGs ?**
- **MODIFY AIR WING COMPOSITION ?**

Part II: Summary

(1) Reduce CVBG deployments?

- National policy requires forward presence and crisis response.
- Long-range bombers cannot sustain presence
- Bombing is not an appropriate response for many crises

(2) Reduce CVBG force levels?

- CVBGs provide multi-warfare capabilities that are needed in peacetime, crises, and regional conflicts.
- Bombers and CVBGs are not substitutable.

(3) Modify air-wing composition ?

- DON is examining the tradeoffs.

REDUCE FORWARD DEPLOYMENTS?

- **FORWARD PRESENCE REMAINS A KEY ELEMENT IN U.S. NATIONAL SECURITY STRATEGY**
 - **U.S. RETAINS GLOBAL INTERESTS**
- **HISTORY AND CURRENT EVENTS CONFIRM NAVY ROLE**
 - **IN PEACETIME: A VISIBLE, FLEXIBLE DETERRENT**
 - **IN CRISES: FIRST IN -- LAST OUT**
 - **LAND-BASED PRESENCE DECLINING**
- **BOMBERS DO NOT SUBSTITUTE FOR DEPLOYED FORCES**
 - **CANNOT PROVIDE SUSTAINED PRESENCE**
 - **DO NOT HAVE CAPABILITY FOR MANY CRISES**
- **MODEST COST (< 6% OF CVBG OPERATING COSTS)**

REDUCE NUMBER OF CVBGs?

- **CVBG PROVIDES MULTIWARFARE CAPABILITY**

- PROMOTES STABILITY IN PEACETIME BY VISIBLE PRESENCE AND ABILITY TO RESPOND TO VARIED CONTINGENCIES
- ON SCENE EARLY TO ENABLE JOINT OPS IN REGIONAL WAR

- **COMBINED ARMS CAPABILITIES REQUIRED IN CRISES AND REGIONAL CONFLICTS**

- BOMBING IS NOT A PANACEA

- **STRATEGIC BOMBERS AND TACTICAL AIRCRAFT ARE COMPLEMENTARY AND SYNERGISTIC**

MODIFY AIR-WING COMPOSITION?

- Airwing composition is reviewed regularly and modified in response to resource constraints and to changes in the threat
- Tradeoffs are being examined in the A-X development program and COEA
 - Degree of stealth
 - Range/payload
 - Multirole capability

PART IV

CONCLUDING DISCUSSION

- **MULTIMISSION CAPABILITIES**
- **COMMON MISCONCEPTIONS**
- **PAYLOAD DELIVERED**
- **COMPLEMENTARITY OF FORCES**

MULTIMISSION CAPABILITY

- THE U.S. REQUIRES A COMBINED ARMS MILITARY FORCE THAT IS CAPABLE ACROSS A RANGE OF CONTINGENCIES
- BATTLE GROUPS ARE CAPABLE MULTIMISSION FORCES THAT ARE VALUABLE IN PEACETIME, CRISES, AND REGIONAL WAR
- STRATEGIC BOMBERS ARE ALSO VALUABLE, BUT ARE SUITED PRIMARILY TO BOMBING OPERATIONS
- BOMBERS AND BATTLE GROUPS ARE NOT SUBSTITUTABLE

COMMON MISCONCEPTIONS

MISCONCEPTION

Long-range bombers can deliver much more payload than tactical aircraft

All battle groups do is deliver a few bombs; their other capabilities are purely defensive "overhead".

ACTUAL CAPABILITY

- Higher sortie rates enable tactical aircraft to deliver as much payload as bombers over the course of a campaign.

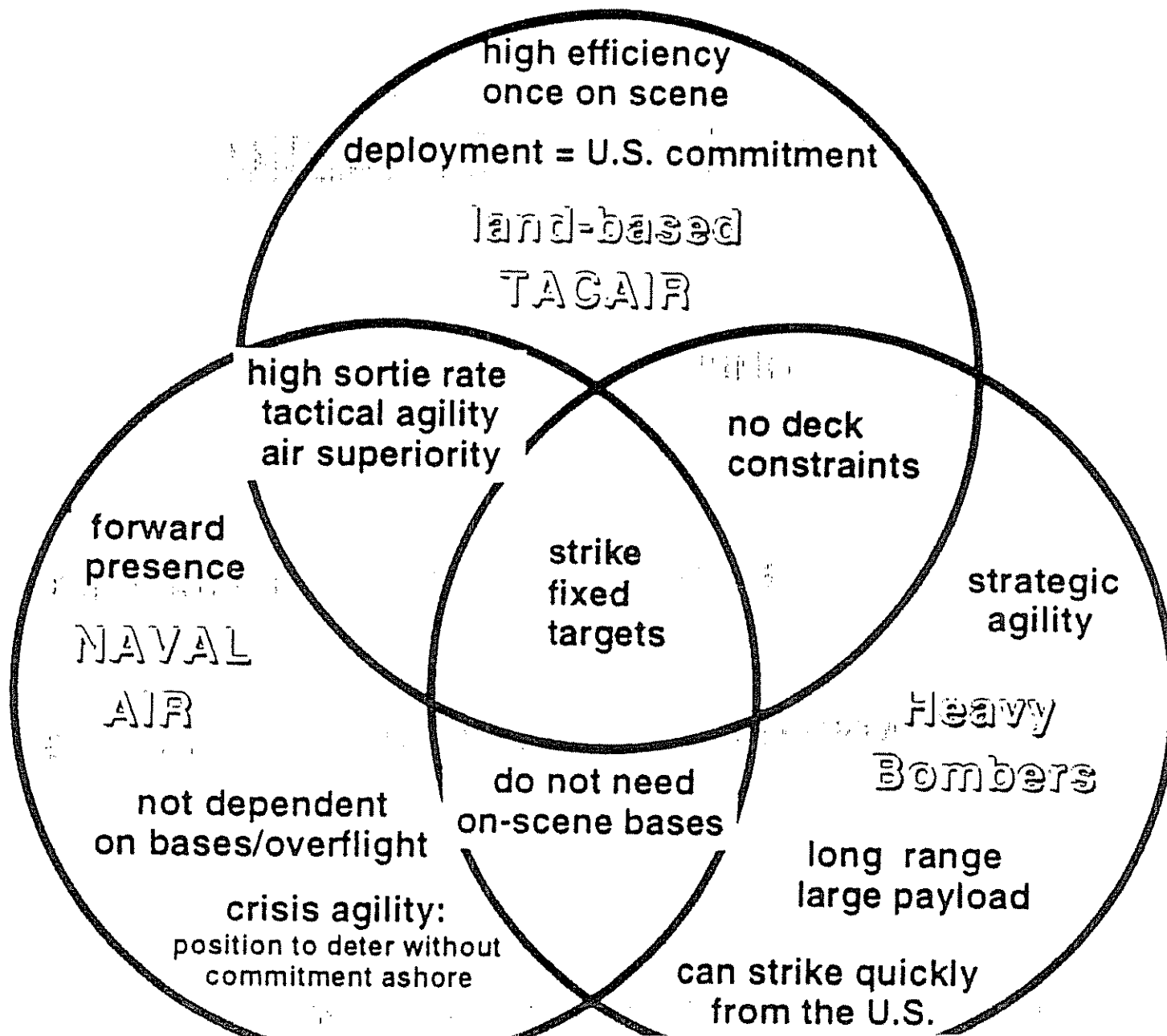
- The A-X can deliver as many bombs per dollar as the B-2.
- More important, battle groups provide air superiority and sea control, which are essential military tasks for a variety of crises and regional scenarios.

This paper cited two important misconceptions that often occur in these types of discussions. One is the notion that payload on a single strike is an appropriate measure of comparison of bomber and tactical aircraft. Although it is true that bombers can deliver more payload on a single strike, tactical aircraft can deliver more payload over the course of a campaign. The second misconception is that battle groups are purely defensive "overhead". Battle groups provide air superiority and sea control, which are essential military tasks for a variety of crises and regional scenarios.

PAYLOAD DELIVERED

THE A-X IS COMPETITIVE WITH THE B-2 IN PAYLOAD
DELIVERED PER DOLLAR:

- EQUAL FIREPOWER IN MOST INITIAL OPERATIONS
- GREATER FIREPOWER IN EXTENDED OPERATIONS



CONCLUSIONS

- ***BOMBERS vs. CVBGs:*** not substitutable
 - CVBGs supply multiwarfare capabilities that are needed in peacetime, crises, and regional wars.
- ***B-2 vs. A-X:*** comparable and complementary
 - Comparable capability per dollar in common missions
 - Unique capabilities to carry out complementary missions